attended by gales of hurricane force at sea, and at night by destructive wind and heavy rain over Nova Scotia. From the 6th to 12th low pressure continued over mid-ocean. On the 11th a cyclonic disturbance was central over the east part of the Gulf of Mexico, with heavy rain and high wind on the east Gulf coast. By the morning of the 12th the storm was central near extreme western Florida, after which it apparently dissipated. On the 14th a storm which apparently developed off the south Atlantic coast was central about midway between Bermuda and the North Carolina coast, whence it passed rapidly to Newfoundland by the 15th, and thence northwest of the British Isles by the 18th, with fresh to strong gales along the steamship routes.

On the 18th a cyclonic disturbance was indicated south of western Cuba. On the 19th the cyclone center was apparently located west-southwest of Havana, and on the 20th it was central over the middle Gulf, with high winds and heavy rain on the central and west Gulf coasts, and thunderstorms over the east Gulf. On the 18th a cyclone appeared northeast of the Windward Islands, whence it moved slowly northwestward and passed east of Bermuda about midnight of the 21st. Recurving eastward, the storm-center reached the 40th parallel in about longitude W. 45° on the 25th, where it apparently recurved northward and united with an area of low pressure which was central over Newfoundland on the 26th. The influence of this storm was felt at Bermuda from the 19th to 23d. On the 19th the wind at that place was northeast, force 2 to 4, with barometer falling to 29.88 (759) at 9 p. m. On the 20th the wind shifted from northeast to north-northeast, force 5, at noon, with pressure 29.71 (755) and to north at midnight, force 5 to 6, pressure 29.40 (747). On the 21st the wind shifted from north to north-northwest at 8 a. m., force 5 to 6, and pressure 29.21 (742), and to northwest at 2 p. m., force 5 to 6, pressure 29.15 (740). The barometer continued to fall until midnight, when it read 28.95 (735), with wind northwest, force 6 to 7, after which it rose to 29.55 (751) by midnight of the 22d, and to 29.90 (759) by 9 p. m. of the 23d, with wind shifting from northwest to north-northwest and diminishing in force. On the 21st a Spanish brig loaded with mahogany lumber was wrecked on the southwest shore of the island; the crew was saved. Trees were blown down; but little damage was caused to buildings.

During the last decade of the month the pressure continued low over mid-ocean, with periods of heavy gales, and on the 27th the pressure fell below 29.00 (737) in that region, and strong to whole gales continued until the close of the month. Heavy storms were reported in Great Britain on the 21st and 22d, and the pressure continued low over the British Isles from the 26th until the close of the month. On the 25th a disturbance was central over the west part of the Gulf of Mexico, with high winds along the west Gulf coast, and the evening of that date it was apparently central south of the mouth of the Rio Grande River.

OCEAN ICE IN SEPTEMBER.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for September during the last 9 years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
	° ′	° ′		° ′	° ′
September, 1883	48 25	47 10	September, 1883	49 01	44 33
September, 1884	46 06	53 21	September, 1884	47 39	49 14
September, 1885	45 40	48 22	September, 1885	48 40	46 27
September, 1886	46 40	53 00	September, 1886	48 00	48 40
September, 1887	45 37	40 50	September, 1887	45 37	40 50
September, 1888	Off Cape	Race	September, 1888	53 00	52 08
September, 1889	46 21	48 22	September, 1889	48 59	46 48
September, 1890*	45 30	48 00	September, 1890*	50 30	46 22
September, 1891	Straits of	Belle Isle	September, 1891	53 18	51 20
Mean	47 08	49 33	Mean	49 20	47 20

*On the 4th a large lump of ice 100 feet long and 6 feet above water was reported in N. 36° 49′, W. 42° 18′; this is the lowest latitude in which ice was ever reported in the north Atlantic Ocean.

The table shows that in September, 1891, ice was reported about 4° north and about 4° west of the average southern and eastern limits of Arctic ice as determined from reports of the last 8 years. The southernmost ice, an iceberg, was reported in the Straits of Belle Isle on the 28th, and the easternmost ice, 6 icebergs, was observed on the 20th, in the position given. The table also shows that the current month is the only September during the last 8 years in which ice was not reported south of the 50th parallel. The ice reported for the current month was confined to the region lying between the Straits of Belle Isle and the 51st meridian, where it was observed during the first and third decades of the month. The positions of icebergs reported for September, 1891, are shown on Chart I by ruled shading.

FOG IN SEPTEMBER.

The limits of fog-belts west of the 40th meridian, as reported by shipmasters, are shown on Chart I by dotted shading. In the vicinity of the Banks of Newfoundland fog was reported on 11 dates; between the 55th and 65th meridians on 4 dates; and west of the 65th meridian on 8 dates. Compared with the corresponding month of the last 3 years the dates of occurrence of fog east of the 55th meridian numbered 5 less than the average; between the 55th and 65th meridians 3 less than the average; and west of the 65th meridian 2 more than the average.

The fog reported along the trans-Atlantic steamship routes west of the 40th meridian, and at Weather Bureau stations along the New England and New Jersey coasts, generally attended the advance or passage of general storms.

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

Many of the voluntary stations do not have standard thermometers or shelters.

The distribution of mean temperature over the United States and Canada for September, 1891, is exhibited on Chart II by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Weather Bureau. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the average for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Weather Bureau represents the mean of the maximum and minimum temperatures.

At stations in the Colorado Desert in the east part of San Diego county, Cal., the mean temperature was above 90; the mean values were above 80 in west Arizona and southeast California, along the lower Rio Grande river, and in southern Florida. The mean temperature was lowest at points along the North Saskatchewan River, British America, and at mountain stations in central Colorado, where it was below 50; the mean readings were below 55 at stations on the Central Pacific Railway crossing the summit of the Sierra Nevada Mountains in California, at Rocky Mountain stations in east Idaho, west Montana, and west Wyoming, in the British Northwest Territory, and in the lower Saint Lawrence valley.

DEPARTURES FROM NORMAL TEMPERATURE.

The mean temperature was generally above the normal, slight deficiencies being reported in Florida, along the coast of the

Gulf of Mexico, in the lower Colorado and Gila valleys, in northern California, and on the north Pacific coast. The most marked departure above the normal temperature was noted from the Missouri River over the upper lake region, where it was 5 to 8. The deficiencies noted did not exceed 1.

TEMPERATURE, JANUARY TO SEPTEMBER.

For the period January to September, 1891, inclusive, the mean temperature averaged about normal in the south Atlantic and east Gulf states, the lower Rio Grande, upper Mississippi, and Missouri valleys, the Ohio Valley and Tennessee, and on the north and middle Pacific coasts. In New England, the Lake region, the extreme northwest, and the northern plateau region there was an excess of 1 to 2, and at Key West, Fla., in the west Gulf states, along the eastern slope of the Rocky Mountains, and over the middle and southern plateau regions the deficiency was 1 to 2 for the period named.

PERIODS OF HIGH TEMPERATURE.

The warmest weather of the month occurred over the Rocky Mountain and plateau regions, and generally along the Pacific coast, during the first decade of the month; between the Mississippi River and the Rocky Mountains, along the middle Atlantic coast, and over the Florida Peninsula during the second decade; and from the Lake region to the middle coast of the Gulf of Mexico during the third decade of the month. On the 1st the highest maximum temperature on record for September was reported at Red Bluff and Keeler, Cal. The warm wave of the 16th to 19th was attended by the highest temperature on record for the season from the lower Missouri valley over the upper lake region, where the maximum temperature was above 90, and 1 to 4 higher than previously reported for the second decade of September. The warm wave which extended over the Lake region and the upper Mississippi and Ohio valleys from the 21st to 25th was attended by the highest temperature noted in those regions for the third decade of September, the maximum temperature ranging 6 to 7 above the highest temperature previously noted for the season. This warm wave extended over New England during the 25th and 26th.

PERIODS OF LOW TEMPERATURE.

The coolest weather of the month occurred from the Lake region and the lower Missouri valley to the Gulf of Mexico, and in New England and the middle Atlantic states during the first decade of the month; in eastern Tennessee and the interior of the south Atlantic states during the second decade; and along the Pacific coast, over the Rocky Mountain and plateau regions, from the Missouri Valley over the west part of the Lake region, along the immediate south Atlantic coast, and in the Florida Peninsula during the third decade of the month. The cool wave of the first decade was attended by frost in Iowa, the Dakotas, Minnesota, Wisconsin, Michigan, Illinois, Missouri, Wyoming, parts of Pennsylvania and Maryland, and generally in New England. The 9th was reported the coolest September day on record at Baltimore, Md. The cool wave of the third decade was attended by frost in Oregon, northern California, Utah, Montana, the Dakotas, Nebraska, Kansas, Iowa, Missouri, and Illinois.

YEARS OF HIGHEST MEAN TEMPERATURE IN SEPTEMBER.

Over the north-central part of the country from northeast Colorado and east Wyoming and Montana to the west part of the Lake region, at stations on the New England coast, and in the interior of North Carolina and New Mexico the current month was the warmest September on record, and in the Red River of the North and middle Missouri valleys the mean temperature was 3 to 5 higher than previously noted for September. In 1888 the month was the warmest September on record over the Rocky Mountain and plateau regions and along the Pacific coast; in 1884 from the middle-eastern slope of the Rocky Mountains to the Gulf of Mexico; and in 1881 generally east of the Mississippi River.

YEARS OF LOWEST MEAN TEMPERATURE IN SEPTEMBER.

In Texas and Indian Territory the lowest mean temperature on record for September was noted in 1889; at stations along the New England and middle Atlantic coasts in 1888; generally over the Rocky Mountain and plateau regions and on the middle and north Pacific coasts in 1884; over the east part of the Lake region and in the lower Missouri valley in 1883; in the middle and east Gulf states in 1880; in the middle and lower Ohio and middle Missouri valleys and over the east part of the middle plateau region in 1879; in the upper Mississippi valley and the north part of the upper lake region in 1873; and along the Atlantic coast from New Jersey to Georgia in 1871.

In 1888, when the mean temperature was the highest on record west of the Rocky Mountains, it was the lowest ever reported for September along the New England and middle Atlantic coasts, and in 1884, when it was the highest ever noted from the middle-eastern slope of the Rocky Mountains to the Gulf of Mexico, it was the lowest on record for the month generally west of the Rocky Mountains.

DEVIATIONS FROM NORMAL TEMPERATURE.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for September for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for September 1891; (4) the departure of the current month from the normal; (5) and the extreme monthly mean for September during the period of observation and the years of occurrence:

State and station.	County.	(1) Normal for the month of Sept.	(2) Length of record.	(3) Mean for Sept., 1891.	(4) Departure from normal.	(5) Extreme monthly mean for September.			
						Highest.	Year.	Lowest.	Year.
Arkansas.		°	*Years*	°	°	°		°	
Lead Hill	Boone	70.5	10	75.6	+ 5.1	76.4	1884	67.5	1883
California.									
Sacramento	Sacramento	68.6	37	62.5	— 6.1	76.0	1853	61.9	1884
Connecticut.									
Middletown	Middlesex	60.7	23	64.8	+ 4.1	64.8	1891	52.4	1871
Florida.									
Merritts Island	Brevard	79.7	9	80.0	+ 0.3	82.5	1882	78.0	1890
Georgia.									
Forsyth	Monroe	76.4	17	77.2	+ 0.8	82.2	1884	72.8	1888
Illinois.									
Peoria	Peoria	66.8	35	70.4	+ 3.6	73.4	1865	60.2	1866
Riley	McHenry	60.8	25	68.4	+ 7.8	68.4	1865,'91	56.4	1888
Indiana.									
Vevay	Switzerland	68.3	25	68.6	+ 0.3	76.3	1881	63.0	1869
Iowa.									
Cresco	Howard	58.5	18	64.6	+ 6.1	64.6	1891	54.3	1873
Monticello	Jones	61.3	37	65.5	+ 4.2	73.1	1865	51.0	1856
Logan	Harrison	64.9	17	69.8	+ 4.9	70.2	1886	61.3	1876
Kansas.									
Lawrence	Douglas	66.8	28	.....	.....	71.2	1886	61.8	1868
Wellington	Sumner	69.0	12	.....	.....	74.5	1884	63.8	1883
Louisiana.									
Grand Coteau	Saint Landry	77.4	8	77.4	0.0	81.6	1884	74.7	1890
Maine.									
Orono	Penobscot	56.8	21	60.8	+ 4.0	60.8	1891	52.4	1873
Maryland.									
Cumberland	Allegany	62.1	32	67.1	+ 5.0	70.0	1881	55.7	1863
Massachusetts.									
Amherst	Hampshire	60.2	55	63.6	+ 3.4	67.4	1881	50.9	1858
Newburyport	Essex	60.5	13	64.1	+ 3.6	64.4	1884	57.0	1888
Somerset	Bristol	64.5	19	68.7	+ 4.2	69.2	1881	61.6	1885
Michigan.									
Kalamazoo	Kalamazoo	61.8	15	67.8	+ 6.0	69.0	1881	55.2	1879
Thornville	Lapeer	61.8	14	65.3	+ 3.5	71.0	1881	57.8	1879
Minnesota.									
Minneapolis	Hennepin	58.1	26	65.8	+ 7.7	67.7	1865	49.9	1868
Montana.									
Fort Custer	Custer	58.0	12	63.2	+ 5.2	63.2	1891	54.0	1884
New Hampshire.									
Hanover	Grafton	56.9	55	61.0	+ 4.1	62.9	1881	50.3	1848
New Jersey.									
Moorestown	Burlington	65.2	28	67.9	+ 2.7	73.6	1881	60.6	1871
South Orange	Essex	63.5	21	65.6	+ 2.1	71.8	1881	53.0	1871
New York.									
Cooperstown	Otsego	55.4	37	61.6	+ 6.2	66.7	1881	53.3	1860, '63
Palermo	Oswego	58.9	31	62.7	+ 3.8	65.1	1881	54.5	1883
North Carolina.									
Lenoir	Caldwell	65.2	19	67.9	+ 2.7	71.1	1884	55.2	1878
Ohio.									
N'th Lewisburgh	Champaign	64.3	59	69.0	+ 4.7	73.0	1881	55.0	1835
Wauseon	Fulton	62.8	21	67.6	+ 4.8	71.1	1881	57.2	1883
Oregon.									
Albany	Linn	60.9	13	58.1	— 2.8	64.7	1888	53.3	1884
Eola	Polk	59.6	21	57.4	— 2.2	65.3	1876	51.2	1881

Deviations from normal temperature—Continued.

State and station.	County.	(1) Normal for the month of Sept.	(2) Length of record.	(3) Mean for Sept., 1891.	(4) Departure from normal.	(5) Extreme monthly mean for September.			
						Highest.	Year.	Lowest.	Year.
Pennsylvania.		°	*Years*	°	°	°		°	
Dyberry	Wayne	58.0	24	60.6	+ 2.6	66.9	1881	52.5	1871
Grampian Hills	Clearfield	60.4	27	64.4	+ 4.0	72.0	1881	54.2	1871
Wellsborough	Tioga	58.9	12	59.0	+ 0.1	73.8	1881	52.3	1883
South Carolina.									
Statesburgh	Sumter	72.5	10	72.0	− 0.5	77.9	1881	69.9	1888
Tennessee.									
Austin	Wilson	71.9	20	71.5	− 0.4	78.2	1881	67.6	1875
Texas.									
New Ulm	Austin	77.3	19	77.6	+ 0.3	81.0	1872	74.6	1889
Vermont.									
Strafford	Orange	59.7	18	63.1	+ 3.4	64.4	1879	56.2	1876
Virginia.									
Birdsnest	Northampt'n	70.9	22	71.9	+ 1.0	79.1	1881	61.2	1877
Washington.									
Fort Townsend	Jefferson	57.3	16	55.3	− 2.0	63.5	1874	53.9	1884
Wisconsin.									
Madison	Dane	60.8	14	67.0	+ 6.2	67.0	1891	57.5	1890

MAXIMUM TEMPERATURE.

The maximum temperature was 1 above the highest temperature previously reported for September at Red Bluff and Keeler, Cal., on the 1st, and at La Crosse, Wis., on the 18th, and equaled the highest temperature on record at Duluth, Minn., on the 17th, at Huron, S. Dak., on the 18th, at Grand Haven, Mich., on the 19th, and at Dubuque, Iowa, on the 21st.

The maximum values were above 110 in the lower Colorado and middle and lower Gila valleys, and a reading of 120 was reported at Maricopa, Ariz.; in the central valleys of California, at stations in the west parts of the middle and southern plateau regions, in south-central Oregon, central lower Michigan, south Texas, south New Mexico, and at points in the central valleys east of the 87th meridian temperature above 100 was reported. The lowest maximum temperature was noted in extreme northwest Washington and along the north California coast, where it was 70 or below, and the maximum readings were below 80 in east New England, on the extreme southeast New England coast, and along the immediate Pacific coast north of the 40th parallel.

MINIMUM TEMPERATURE.

At Keeler, Cal., the minimum temperature on the 30th, 43, was 7 lower than previously reported at that station in September.

Minimum temperature below 20 was reported in an area extending over east-central Nevada, and in the northeast part of southern Idaho, and minimum readings below 30 were noted in north New England, north-central lower Michigan, north-central Wisconsin, northwestern Minnesota, the east parts of the Dakotas, and generally over the middle and northern plateau regions, except in parts of Utah and western Colorado, and in the valley of the Columbia River. The highest minimum temperature reported, 70, was noted at Key West, Fla., and the minimum readings were above 60 on the extreme eastern North Carolina coast, along the Atlantic coast south of North Carolina, and along the immediate Gulf coast.

LIMITS OF FREEZING WEATHER.

The southern and western limits of freezing weather are shown on Chart V. The southern limit is indicated by a line traced over north New England, by lines inclosing areas in north-central lower Michigan and north-central Wisconsin within which the temperature fell below 32, and by a line traced southward over western Minnesota to northern Iowa, thence westward to central Nebraska, thence northward east of the Missouri River to extreme northeast Montana, thence southward to north-central New Mexico, thence to central Arizona, and thence north of west over southern Nevada to east-central California, and the western limit is shown by this line continued northward over eastern California and central Oregon and Washington to British Columbia. In areas in the plateau region north of this line the minimum temperature was above 32, notably from northern Utah to west-central Colorado, and in the valley of the Columbia River in eastern Oregon and eastern Washington, where the minimum readings were 4 to 12 above the freezing point.

RANGES OF TEMPERATURE.

The greatest daily range of temperature is given in the table of miscellaneous data. The greatest monthly ranges were noted in the middle Missouri valley and from north-central Nevada over eastern Oregon, where they exceeded 60. From the Missouri Valley the monthly ranges decreased eastward to the extreme southeastern New England coast, where they were less than 30, southeastward to 17 at Hatteras, N. C., to 20 at Titusville and Key West, Fla., and on the middle Gulf coast, and from the middle part of the plateau region they decreased to the extreme northwest Washington and northern California coasts, where they were less than 30, and to the extreme southern California coast, where they were less than 40.

FROST.

The first light frost of the season was reported at Duluth, Minn., and Lander, Wyo., on the 3d; at Springfield, Ill., on the 4th; in southeast lower Michigan on the 8th; at points in New York and New England from the 8th to 11th; at stations in Utah on the 12th, 16th, and 24th; at Winnemucca, Nev., on the 17th; at Montrose, Colo., on the 19th; at points in northwestern Oregon on the 22d, 23d, and 27th; in eastern Oregon on the 23d; in western Missouri, eastern Kansas, and southwestern Iowa on the 29th; in the mountains of northeastern California on the 29th and 30th; and at Chicago, Ill., and Eureka, Cal., on the 30th.

The first heavy frost of the season was reported at Cheyenne, Wyo., on the 3d; at Baker City, Oregon, on the 24th; at Fort Assiniboine, Mont., and Fort McKinney, Wyo., on the 28th; in eastern Kansas and southeastern Nebraska on the 29th; and at Susanville, Cal., Helena, Mont., and Farmington, Me., on the 30th.

In the interior of the Atlantic coast states frost occurred as far south as south-central Pennsylvania on the 9th to 11th and 30th; in northern West Virginia on the 9th and 10th; on low ground in Carroll county, Md., on the 10th; in the Ohio Valley north of the Ohio River on the 9th and 30th; in Kansas and western Missouri on the 3d, 4th, 28th, and 29th; from the plateau region to south-central Arizona on the 25th and 26th; generally throughout the northern half of Nevada at intervals during the second and third decades of the month; in northern California on the 29th and 30th; and in western Oregon and western Washington at intervals during the third decade of the month.

In 1890 the first heavy frost of the season was reported in September at points in the northern tier of states from the Atlantic to the Pacific oceans; along the Atlantic coast to New Jersey; in the central valleys to Ohio, Missouri, and Kansas; in the plateau region to Colorado and Utah; and in Washington and Oregon. Records of previous years show that the first heavy frost of the season is not uncommon in September in New England, New York, northern Ohio, the upper lake region, and in the states of the middle and upper Missouri valleys.

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada, for September, 1891, as determined from the reports of nearly 2,000 stations, is exhibited on Chart III. In the table of miscellaneous meteorological data the total precipitation and the departure from the normal are given for regular stations of the Weather Bureau. The figures opposite the names of the